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ABSTRACT

This annotated bibliography on mathematics curriculum for secondary schools abstracts references from sources such as journal articles, books, selections from books, textbooks, teaching guides, conference reports, resource guides, program descriptions, and curriculum guides. Topics covered include goals of curriculum, reforms in curriculum, current issues in mathematics education, calculators and computers in the curriculum, and other current trends. (MP)

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ANNOTATED BIBLIOGRAPHY OF MATHEMATICS CURRICULUM 1970-1978

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December, 1978

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Adler, Irving. "Cambridge Report: Blueprint or Fantasy?" Mathematics Teacher, 59: 210-217, March 1966.

In this article, Adler summarizes the goals of the Cambridge Conference which he believes are attainable (with great effort) by 1990. He also includes 17 principles of curriculum development necessary to attain these goals.

Adler, Irving. "Criteria of Success in the Seventies, "Mathematics Teacher, 65: 33-41, January 1972.

Among his "criteria of success," Adler proposes more attention to concepts of negative number, group, and vector space in the curriculum. He feels that goals on a course of study for geometry should be clarified. The author also states that applications of mathematics to the sciences should be introduced on every grade level.

Aichele, Douglas B. and Robert E. Reys (Editors). "Another Revolution?" Readings in Secondary School Mathematics, Boston, Massachusetts: Prindle, Weber & Schmidt, Inc., 499-504, 1977.

This article by G.D. Baughman discusses reforms in mathematics education. The author states that coming curriculum will be based more upon process and less upon content. He therefore proposes a "heuristic-cognitive" pattern as a basis for learning mathematics.

Aichele, Douglas B. and Robert E. Reys (Editors). "Arguments For and Against Hand Calculators," Readings in Secondary School Mathematics, Boston Massachusetts: Prindle, Weber & Schmidt, Inc., 383-388, 1977.

This excerpt is taken from Richard Shumway's article "Hand Calculators: Where do you Stand?" reprinted from the November 1976 issue of the Arithmetic Teacher. Shumway elaborates on 17 reasons why calculators should be used in the classroom and 10 arguments against the use of calculators. He summarizes these arguments and he proposes that educators must answer two questions to come to a solution to the problem: "What are the current and future societal needs for the basic fact and the paper and pencil algorithms?" ; "Can the hand-held calculator be used in the classroom and still build students needed skills?"

Aichele, Douglas B. and Robert E. Reys (Editors). "Proposed Secondary School Mathematics Program," Readings in Secondary School Mathematics, Boston, Massachusetts: Prindle, Weber & Schmidt, Inc., 42-60, 1977.

This is an excerpt from the Goals for School Mathematics, The Report of the Cambridge Conference on School Mathematics, (1963). It presents topical outlines of the two integrated curricular proposals presented in the Cambridge Conference. Also included is a comparison of the curricular proposals, the goal of which is to include into the K-12 curriculum subject matter which should bring a student to a level of training comparable to three years of college training.

Aichele, Douglas B. and Robert E. Reys (Editors). Readings in Secondary School Mathematics, Boston, Massachusetts: Prindle, Weber & Schmidt, Inc., 1977.

This book presents selected readings on current issues in mathematics education. Articles present viewpoints of those authors for and against change in mathematics education. The book contains nine sections which explore different aspects of mathematics education including mathematics curriculum, and curriculum change. (Some articles are listed separately in this bibliography). In addition, an extensive bibliography of other articles related to each section is found at the end of the readings. It is a superb book and was used as a guide in formulating this bibliography.

Aichele, Douglas B. and Robert E. Reys (Editors). "The Revolution of the Fifties and Sixties - An Overview," Readings in Secondary School Mathematics, Boston Massachusetts: Prindle, Weber & Schmidt, Inc., 3-15, 1977.

This excerpt, from Stephen Krulik's and Ingrid B. Weise's book, Teaching Secondary School Mathematics (1975), lists significant events in mathematics education during the fifties and sixties including those curriculum reform projects which still have great impact on mathematics education today. Among those projects summerized are University of Illinois Committee on School Mathematics, School Mathematics Study Group and the Comprehensive School Mathematics Project.

Aichele, Douglas B. and Robert E. Reys (Editors). "What Are the Issues and Trends Concerned with Mathematics Education," Readings in Secondary School Mathematics, Boston, Massachusetts: Prindle, Weber & Schmidt, Inc., 491-498, 1977.

Howard Fehr identifies trends in mathematics education. His views as to the trends in the curriculum are as follows: correct mathematical language will be stressed; present emphasis on conceptual learning will continue and grow stronger; the unification of the study of mathematics will increase; "an increasing amount of mathematical knowledge and methods of application will have to be learned in pre-college schooling" (497); use of mathematics in secondary school science will grow; axiomatic structure will continue to be an important part of high school mathematics; the standard Euclidean geometry course will be "abandoned" with vectors, transformations, linear algebra and coordinate geometry taking its place; use of computer-oriented study (numerical analysis) will play a larger role; statistics and probability will become a necessary part of the curriculum; the first course in calculus will become a regular part of high school mathematics; "algebra will become the most predominant part of school mathematics"(498).

Atchison, William F. "The Impact of Computer Science Education on the Curriculum," Mathematics Teacher, 66: 81-83, January 1973.

Author advocates the necessity of computers in the secondary school as well as the need for more programs for educating teachers to teach programming. He gives a brief history of computer education in secondary schools as well as some new developing programs in computer education.

Bacon, Chris and Nigel Webb. "Co-operation Between Science and Mathematics Departments," Mathematics in School, 4: 6-9, November 1975.

According to the ERIC journal abstract #EJ130226, this article presents a dialogue between heads of mathematics and science

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departments at a British school. The relationship between science and mathematics curriculum and instruction is discussed.

"Basic Skills: Position Papers from the National Council of Teachers of Mathematics and the National Council of Supervisors of Mathematics," Arithmetic Teacher, 25: 18-22, October, 1977.

This article describes the forces which "rejuvenated" the "back to basics" movement in mathematics, clarifies the position of the National Council of Supervisors of Mathematics on basic skills, establishes a framework in ten areas of mathematics within which curriculum planning and implementation can be made as well as provides a rationale for identifying and developing basic skills. The ten areas include problem solving, applying mathematics to everyday situations, alertness to the reasonableness of results, estimation and approximation, appropriate computational skills, geometry, measurement, reading tables, charts and graphs, probability, and computer literacy.

Beckmann, Milton W. "Basic Competencies - Twenty-Five Years Ago, Ten Years Ago and Now," Mathematics Teacher, 71: 102-105, February 1978.

This article reviews a twenty-five year research program involving ninth grade Nebraska students (approximately 1300 students studied each year) on basic mathematical competence. Some findings include: Students are less mathematically literate than they were ten years ago; new math is not to blame for the declining test scores (the 1965-66 students were exposed to "new math" and showed a substantial improvement over the 1950-51 class). Recommendations: "Educators should protect the significant improvement in curriculum achieved during the last generation and refine the tests and instruction materials used in the evaluation and teaching of mathematical literacy." (105)

Beckmann, Milton W. "Teaching the Low Achiever in Mathematics," Mathematics Teacher, 62: 443-446, October 1969.

Although somewhat outdated, this article provides good suggestions and resources for teaching low achievers in mathematics.

Begle, E.G. "Some Lessons Learned by S.M.S.G." , Mathematics Teacher, 66: 207-214, March 1973.

Begle describes the results of the National Longitudinal Study of Mathematical Abilities sponsored by S.M.S.G. Some of the findings include the following: Attempts made by S.M.S.G. to find what it takes to make an effective math teacher were unsuccessful; Evidence indicates most student learning is directed by texts rather than by teaching; Location of specific topics in the curriculum should be based not on the students' age level but on the "overall structure of mathematics," i.e. geometry does not have to be presented in the 10th grade, probability can be successfully introduced into the elementary curriculum;Low ability students when given more time to learn math will do just as well as above-average students; Student "attitude changes seem not to be affected by the nature of the curriculum to which the student has been exposed" ; "The best predictor of mathematics achievement is previous mathematics achievement." (213)

Begle, Edward G. and Selfridge, Oliver. "What's All the Controversy About? Two Reviews of Why Johnny Can't Add," The National Elementary Principal, 53: 26-34, February 1974.

This article presents two reviews of Morris Kline's book Why Johnny Can't Add: The Failure of the New Math. Kline is a famous critic of the "new math" of the sixties and calls for a re-evaluation of math education. Begle, one of the foremost creators of the "new math" disputes Kline's point of view vehemently: "let us note that Professor Kline presents not a shred of evidence that modern mathematics is detrimental to computational skill or to mathematics skill in general." (28) Begle then sights results for the National Longitudinal Study of Mathematical Abilities which he says proves that Klines opinions are "clearly wrong." (28) On the other hand, Selfridge (OF MIT's School of Electrical Engineering) believes that "Kline is right in his criticisms of the new math." He, along with Kline is critical of new math topics such as set theory, number bases, and the rigorous axiomatic approach in algebra.

Both points of view summerize the success and failures of the new math.

In addition, this issue of the National Elementary Principal contains other articles on mathematics education which can be applied to the secondary level.

Bell, Frederick H. "Can Computers Really Improve School Mathematics," Mathematics Teacher, 71:428-433, May 1978.

This is an excellent article on the present status of computers in secondary school education. The author states that past curriculum developments in computer education were initiated by teacher and student workshops. Presently he lists the current journals, magazines and companies which have followed suit and now provide materials for use in high schools. Bell then details nine ways past programs have used computers. These uses he states can now be fulfilled by calculators at less cost. Nevertheless, Bell sees the computer as a superior mathematical tool to the calculator. Bell feels that innate to the process of computer programming there is independent problem solving and if students were given more of a free hand to working with the computer by themselves they would become highly motivated.

Bell, Frederick H. Teaching and Learning Mathematics in Secondary Schools, Iowa: William C. Brown Company, 1978.

This textbook for secondary school math teachers was used as a basis for this bibliography. It effectivally provides an analysis of mathematics content, secondary school curriculum, theories of learning and other current trends in mathematics education at the high school level. It also provides an annotated bibliography of references related to topics presented in each chapter. The Chapter on curriculum is extensive. Included in it are changes in society and education which brought on new curriculum projects such as UICSM, SMSG, SSMCIS, and PLATO. The effects these projects had on teacher education are presented as well as a catalogue and comparison of topics of the traditional courses in mathematics with those course offerings of SMSG and SSMCIS in Algebra, Geometry and Trigonometry.

Bell, Max. "Calculators in Secondary School Mathematics," Mathematics Teacher, 71: 405-410, May 1978.

Bell concurs with the "Report of the Conference on Need Research and Development in Hand-Held Calculators in School Mathematics, 1976." (This report is annotated in this bibliography)

Bell, Max S. "Mathematical Models and Applications as an Integral Part of a High School Algebra Class," Mathematics Teacher, 64: 293-300, April 1971.

Bell illustrates how mathematical models and applications can be used in teaching algebra. He includes examples of models used to motivate the learning of specific topics such as negative numbers, inequalities, systems of equations. References on applications which provide "inspiration" to students are suggested as well as presentation of a long term development of a single mathematical model.

Bell, Max S. "What Does 'Everyman' Really Need from School Mathematics?" Mathematics Teacher, 67: 196-202, March 1974.

Bell presents a curriculum model and elaborate guide of what people should accomplish in the learning of mathematics. Bell's list includes objectives under thirteen headings; Uses of Numbers, Use of Computation Algorithms, Relations, Measure Concepts, Use of Estimates, Links between Mathematics and the Real World, Uses of Variables, Correspondences, Mappings, Functions, Transformations, Logic, Probability and Statistics, Geometric Relations, Interpretation of Graphs, and Computer Uses.

Bezuszka, Stanley J. and Margaret Kenney. Motivated Math Project Activity Booklets, Boston College Mathematics Institute, Chestnut Hill, Massachusetts: Boston College Press, 1976.

These booklets emphasize problem solving and are designed as supplementary material for both the elementary and secondary level. "Problems are selected to re-enforce classroom instruction, to motivate and challenge, to provide paper and pencil activities that can be supplemented by hand calculator and computer use." Topics on the secondary level include "Fraction Action 2", "Finite Differences," "Super Sum;" "Applications of Geometry Series" and "The Incredible Pascal Triangle."

BO-CEC Math Resource Guide: Grades 7-9: Colorado State University Ft. Collins Dept. of Vocational Education. Washington D.C. : Bureau of Adult, Vocational and Technical Education, (DHEW/OE), 1975.

According to ERIC docment abstract #ED112079, this guide is used to supplement regular classroom instruction and to introduce career education. There are fourteen units, each emphasizes an occupational setting (industry, public service, organizations, communications). The purpose of this program is to give students insight into the importance of mathematics by showing how it's used in everyday life.

Bothamley, Herbert. Three-Year Sequence for High School Mathematics, Course I. Albany, New York: New York State Education Dept., Bureau of General Education Curriculum Development, October 1976.

According to ERIC document # ED134473, "this curriculum guide covers Course I of a three-year sequence for high school mathematics in New York which was intended to provide an alternative to the regular regents sequence of ninth, tenth, and eleventh- grade mathematics. A listing of scope and content for Course I is provided, along with a suggested time allotment. Four mathematics units are covered: logic; aspects of algebra and geometry; probability, permutations, and statistics; and rectangular coordinate systems."

Brant, Vincent. "Mathematics for Basic Education,Grades 7-11," National Council of Teachers of Mathematics Yearbook 35: The Slow Learner in Mathematics, Washington D.C.: National Council of Teachers of Mathematics, 371-379, 1972.

This article presents Baltimore County's program for non-college bound students in basic mathematics. Topical divisions of the curriculum guides include: Numbers, Operations and Algorithms, Geometry, Measurement, Probability and Statistics, Graphing, Algebra, Logic and Recreational Activities. In these areas behaviors are assigned for grades 7-11 specifying skills and concepts needed for mathematical competency. Geometry Course for grades 6-10 is given as an example.

Brown, Gerald W. and Lucien B Kinney. "Let Us Look Again at General Mathematics," School Science and Mathematics, 75: 615-620, November 1975.

Authors state that general mathematics for ninth grade students is "problem solving mathematics" and as such they focus on the purposes, problems, development and requirements of a general mathematics program.

Buchman, Aaron L. and Frank S. Hawthorne. "The Content of High School Computer Mathematics Courses," School Science and Mathematics, 75: 543-549, October 1975.

In 1971 the Mathematics Education Bureau of New York sent out a questionnaire on content of high school computer courses. Replies were received from 165 teachers representing 138 New York Schools. The topics in the questionnaire were taken from 28 course outlines submitted by the schools. Each teacher was asked to tell whether the topic was taught at the school and to give the topic a rating of relative importance. This article is a study of the results of this questionnaire.

Among the conclusions: The teachers who have experience in computer programming instruction arrived "at a large common core of topics. .. which they feel are important." (549) Lists of percentages and ranks of topics taught in New York schools are then presented.

Bukoski, William J. and Arthur L. Koratkin. "Computing Activities in Secondary Education." Educational Technology, 16: 9-23, January 1976.

This article summarizes in detail a "study (which) provides both a quantitative and qualitative review of the extent and nature of computer use in secondary schools. With a primary focus on instructional computing, the study shows the growth of secondary school computer applications since the previous study in 1970 and explores the current state and future of instructional computing at the secondary school level." (19)

Callihan, Hubert D. and Frederick H. Bell: "Probability and Statistics in High Schools?" School Science and Mathematics, 77: 418-426, May - June 1977.

This article presents a statistical study which gathers information about probability and statistics offerings in Pennsylvania secondary schools. Of the 200 randomly selected schools surveyed, it was found that only 15% offered probability and statistics regularly as a complete course and of those which do not offer probability and statistics, more than half are planning to offer it in the near future. Most Pennsylvania secondary math teachers felt that probability and statistics belonged in the curriculum but that there was inactivity in implementing course recommendations along with too few

programs which prepare them to teach the course.

Carpenter, Thomas P., Terrence G. Coburn, Robert E. Reys, and James W. Wilson. "Results and Implications of the NAEP Mathematics Assessment: Secondary School," Mathematics Teacher, 68: 453-470, October 1975.

Ninety thousand people of age levels 9, 13, 17 and 26-35 were tested in 1972-1973 to determine their "levels of attainment" in mathematical concepts and skills. This article discusses the results of the tests as well as the implications for teaching and revising of mathematics curriculum. Areas of testing and discussion included: whole number concepts and computation, word problems with whole numbers, fractions, decimals, percents, algebra and geometry as well as consumer mathematics.

The authors concluded that there is great need for improvement in mathematics education especially in the area of problem solving. Contrary to the opinion of many critics of the "new math","it did not detrimentally affect computation with respect to a "general level of performance." What was mentioned, however, is that young adults performed higher than 17 year olds on all types of consumer excercises perhaps leading to future emphasis on consumer related problems in mathematics education.

Cech, Joseph P. "The Effect of the Use of Desk Calculators on Attitudes and Achievement with Low-Achieving Ninth Graders," Mathematics Teacher, 65: 183-186, February 1972.

This seven week study involving 4 general math classes; 2 experimental, 2 control, at Maine Township High School in Park Ridge, Illinois, showed no significant effect of the use of desk calculators on attitudes and achievement with ninth grade general math students.

Chipley, Donald R. And Cecil R. Trueblood. "Monitoring the Move to Metrication: A Research Strategy and Survey Summary," School Science and Mathematics, 76: 703-711, December 1976.

Authors examine journals and state departments of education to determine what help (from these sources) is available to educators to build programs of metric education. The authors found very little information from these sources on curriculum programs - years 1965-1975.

Choate, Stuart A. " A Metric Bibliography," The Mathematics Teacher, 67: 586-587, November 1974.

The Author provides a "list of articles books and sources of information" which had been "prepared as part of the work of the Metric Implementation Committee of the National Council of Teachers of Mathematics. "

Comprehensive Problem Solving in Secondary Schools: A Conference Report, Newton, Massachusetts: Education Development Center, Inc., 1975.

This report discusses the rationale for a problem-solving approach in education, gives suggestions for action by school and community groups to implement a comprehensive problem solving program, points out the challenges for curriculum, teaching mode and teaching programs, and student assessment, suggests ways to develpp programs and provides "examples of real problems and how they might be used in a comprehensive problem- solving- based curriculum." (VIII)

Comprehensive School Mathematics Program: List of Available Materials, St. Louis, Missouri: CEMREL, Inc., May 1978
This booklet lists available papers, articles, books, studies, calculators and other materials and their prices from the Comprehensive School Mathematics Program originating at CEMREL, a "national educational laboratory."

Course of Study for Consumer Mathematics. Rockville, Md: Montgomery County Public Schools, 1977.
According to ERIC Document abstract #ED138479 this is a course for secondary school students consisting of 11 units entitled: Consumer Decision Making; Personal Transportation; Insurance; Credit; Banking; Investments; Income Taxes; Food, Clothing, Furniture, Appliances; Housing; Budgeting; and Travel. The teachers' guide to the course includes objectives, description of the organization of the course, recommended time schedules, suggestions for implementation and an annotated list of three texts. With each unit there is an appendix of books and other instructional aids.

Cowan, Richard E. and Clary, Robert C. "Identifying and Teaching Essential Mathematical Skills - Items." Mathematics Teacher, 71: 130-133, February 1978.
Authors devised a questionnaire which was sent to 210 mathematics educators (at least 2 educators in each state of the country) on basic mathematical skills. The questionnaire contained 54 skills and "asked whether the educators felt all, most, half, few, or none of the students in their areas should know the skill." Cowan and Clary then analized the 54 items in order of importance of skills according to the educators.

Critchfield, Margot. "Recent Trends in Mathematics Curriculum Research." Creative Computing 1, 4:64-69, 1975.
Since this important source could not be found from which to annotate directly, the following annotation is taken from Frederick Bell's text, Teaching and Learning Mathematics in Secondary Schools: "A brief review of mathematics curriculum change, the article also contains a useful chronological chart of most of the major mathematics curricular projects from 1952 to 1974." (92)

Davis, Robert B. and Herbert Ginsburg, and others. The Journal of Children's Mathematical Behavior Vol.I #1: Madison Project, Syracuse, New York: Children and Mathematics, Inc., 1972.
The editors of this Journal feel the best foundation for curriculum planning is the observation of children's behavior. The development of the Madison project is based upon the observations and classification of children's behavior in learning mathematics, specifically children between the ages of 3 to 14 years. In this particular volume, ideas on when and how to introduce fractions into the curriculum are discussed and different ideas on mathematics education are presented. Topics of difficulty in the traditional program such as concepts of variable, word problems, ratio and proportion are mentioned as areas which need better curriculum guidelines, especially with respect to the readiness of children to learn them. Attempts are made to classify behavior in terms of the mathematical insights they reveal. A list of these classifications are on page 47. An extensive bibliography is also provided as well as case studies.

Davis, Robert B. and Herbert Ginsburg, and others. The Journal of Children's Mathematical Behavior, Vol II, No. 1: Madison Project, Champaign, Illinois: Study Group for Mathematical Behavior, 1978.

This Journal is based on findings of the Madison Project: a curriculum laboratory at the University of Illinois. It discusses and classifies thought processes of students who are beginning the study of algebra. Interviews with students are provided to analize ways which they solve problems and to assess the progress of their development and learning in mathematics. Approaches to problem solving is emphasized in terms of theoretical (learning theory) postulates and observed behavior.

Dutton, P. E. "Computer Pace," Mathematics in School, 1: 22-23, July 1972.

According to the ERIC Journal abstract # EJ064401, this continuing column of Mathematics in School focuses on work which might be covered in a computer appreciation course for pupils aged 15-16. Fourteen topics that the course would cover are included.

Dutton, P. E. "Computer Pace," Mathematics in School, 1: 20-22, November 1972.

According to the ERIC Journal abstract # EJ070087, this article presents an outline of programming techniques and sample computer programs for high school students.

Dwyer, Thomas A. "Soloworks: Computer - Based Laboratories for High School Mathematics," School Science and Mathematics, 75: 93-99, January 1975.

"This is a preliminary report on a computer-based laboratory approach to mathematics education." (97) Mathematics studied in the Soloworks curriculum is determined by research level projects and skills. The project contains 5 laboratories. The "Computer Lab" focuses on mathematics needed for computer programming. The "Dynamics Lab" uses mathematics "that describes processes that take place in time." Mathematics used for electronic circuitry is presented in the "Logical Design Lab." The "Syntheses Lab" is concerned with mathematics that makes use of the principle of superimposition, producing complex effects by adding together simple ones." (96) The Modeling/Simulation Lab" uses mathematics as a tool for creating real models, both physical and abstract.

Dwyer, Thomas and Margot Critchfield. Basic and the Personal Computer. Reading, Massachusetts: Addison-Wesley, no copyright date was given in the article.

The publishing house sent two articles (with no source named) on the excellence of this book. Since the authors of this book are well published in the field of computer programming, I decided to include it in this bibliography. According to Rod Hallen, the reviewer, Dwyer and Critchfield's book is significantly superior to others on BASIC computer programming, and could easily be used as a guide for courses on the secondary school level.

Eccles, Frank M. "Transformations in High School Geometry," Mathematics Teacher, 65: 103, 165-169, February 1972.

The author believes that the "compartmentalized years" of algebra, geometry and algebra should be eliminated. Instead the curriculum should be integrated in which algebra and geometry would be studied in each year. He thinks that a blend of Euclidean and transformational approaches to

geometry would help to better integrate the curriculum. Futhermore, a functional approach to geometry would give students a better understanding of algebra. He then outlines a yearlong geometry course which follows his recommendations.

Edwards, E.L. Jr., Eugene D. Nichols and Glyn H. Sharpe. "Mathematical Competencies and Skills Essential for Enlightened Citizens," Mathematics Teacher, 65: 671-677, November 1972.

The authors provide an outline of content of basic skills needed by the "enlightened citizen" of 1972. Outlines are included under the following headings: Numbers and Numerals, Operations and Properties, Mathematical Sentences, Geometry, Measurement, Relations and Functions, Probability and Statistics, Graphing, Mathematical Reasoning, Business and Consumer Mathematics.

Emerson, John D. "Introductory Statistics: A Contemporary Approach," Mathematics Teacher, 70: 258-261, March 1977.

Author gives guidelines, objectives and some content for a statistics course for students who have had three years of mathematics. Emerson also suggests texts which demonstate the practicality of statistics. Among the texts he uses are Statistics: A Guide to the Unknown, by Judith M. Tanur, Frederick Mosteller and others, and Introduction to Statistics, A Fresh Approach, by Gottfried E. Noether.

ERIC/SMEAC Publications: ERIC/SMEAC Information Center, Columbus, Ohio: Ohio State University College of Education, August 1978.

This list briefly describes publications available from the Educational Resource Information Center (ERIC)/ Information Analysis Center for Sciences, Mathematics and Environmental Education, (located at 1200 Chambers Road, 3rd floor).

Many ERIC documents and journal abstracts are used in this bibliography since the sources from which they are taken could not be found in the library.

Elements of Mathematics (EM) Program: Comprehensive School Mathematics Program, St. Louis, Missouri : CEMREL, Inc., 1978.

This booklet presents a detailed description of a complete mathematics curriculum for gifted (upper 5-10%) secondary school students, grades 7-12. Topics, both traditional and modern, are treated with rigor and depth up through the college level (chart of college credit for courses is given). Stress is placed on relevant problem solving and applications of mathematics through modeling. Intuitive and formal, logical approaches are discussed. Also age levels for using the "EM" program for non-gifted students are briefly mentioned as well as a course of action for teacher preparation to implement the program.

Exner, Robert M. and Peter J. Hilton. "Should Mathematical Logic Be Taught Formally in Mathematics Classes?" Mathematics Teacher,64: 388-401, May 1971.

This article provides a forum on the pros (Exner) and cons (Hilton) of logic taught "formally" in mathematics classes.

Fehr, Howard F. "The Present Year Long Course in Enclidean Geometry Must Go," Mathematics Teacher, 65: 102, 151-154, February 1972.

Fehr sees geometry as a study of spaces; each geometry is

a set whose elements are points and the structure is a set of axioms along with definitions. Geometry should be within the context of a unified program, (uses SSMCIS as an example), the objective of which is to develop the subject matter so that it leads to basic understanding of vector spaces and linear algebra. Goals for geometric instruction should be to "foster intellectual formation," "transmit important information about space," "develop skill in problem solving."

In this article Fehr also proposes a sequence of study included in the SSMCIS program.

Fehr, Howard F. Secondary School Mathematics Curriculum Improvement Study: Final Report, New York, New York: Teachers College, Columbia University, August 1970.

This report discusses the history, objectives and implementation of the SSMCIS program. Some early results of the application of the program are also included. Among the conclusions stated are: "Students who complete this three year program are advanced in knowledge more than one year beyond the present college preparatory program;" "A study in one school has shown that the same material can be learned by students of average ability, if pursued at a slower rate over a longer period of time." (9)

Included in this report is an outline of Courses I, II, and III.

Fehr, Howard F. "The Secondary School Mathematics Curriculum Improvement Study: A Unified Mathematics Program," Mathematics Teacher, 67: 25-33, January 1974.

This article describes the development, goals, content and initial evaluation of the SSMCIS program. The program is a unified approach to the study of mathematics for the top 15-20 percent of secondary school students. The author states that the program will provide the following: "(1) A contemporary viewpoint of algebra as a study of structures, their number system realizations and the activities derived therefrom. It will prepare college bound students to begin rigorous abstract algebra and linear algebra study at the collegiate level. (2) A modern viewpoint of geometry as a study of spaces eventually related to algebraic structures, especially those of vector spaces and linear algebra. This should be common knowledge of all future educated laymen. (3) An approach to the study of all mathematics via the concepts of sets, relations, functions, operations, and structures, binding the entire instruction by a spiral approach to learning, into a unified body of knowledge. (4) The application of mathematics, not only to physics, but to new areas in the behavioral sciences where probability, finite mathematics, and statistics are important. Mathematical model building is stressed. (5) An intuitive, nonrigorous, but correct and precise introduction to the Calculus." (33)

SSMCIS course outlines are also included in this article.

Finn, Peter and James Brown. "Career Education and the Mathematics Classroom," Mathematics Teacher, 70: 489-496, September 1977.

"Support for including career education in the mathematics curriculum has been endorsed by the National Education Association,

the American Vocational Association, and the National Association of Secondary School Principals." (489) These groups present two reasons for integrating career education into the curriculum: students expanded awareness of occupations in which math is used, and motivation to learn skills and concepts needed in the occupation is increased.

Barriers which make it difficult to include career education in the classroom include little time and flexability to accomodate new subject matter (especially with the back to basics movement). Second, teachers may feel "inhibited by their ignorance of the specific nature of the occupations."

The authors suggest the solution to the problem lies in having students research careers outside the classroom as special projects. They provide three illustrative activities as a guide to interested teachers.

Fitzgerald, William M. "The Role of Mathematics in a Comprehensive Problem Solving Curriculum in Secondary Schools," School Science and Mathematics, 75: 39-47, January 1975.

Author elaborates on the need for comprehensive problem solving and "relevance" in mathematics education.

Firl, Donald H. " Fractions, Decimals, and Their Futures," Arithmetic Teacher, 24: 238-240, March 1977.

Firl suggests educators, especially teachers of elementary and junior high school, should emphasize more and different ways of using decimals and put less emphasis on fractions. This is due to the inclusion of the metric system into the curriculum.

Firl, Donald H. "The Move to Metric: Some Considerations," Mathematics Teacher, 67: 581-584, November 1974

The author gives an historical perspective on the metric system. He also discusses some problems involved in changing to the " International System of Units".

Fishman, Joseph. "Mathematics in Secondary Schbol Vocational Education Programs," Mathematics Teacher, 64: 261-268, March 1971.

After listing and elaborating on criticisms of vocational education, Fishman then attacks mathematics education in the secondary vocational programs. He states that the mathematics programs in vocational schools is largely determined by individual instructors and furthermore, in some areas math as a subject is not even part of the curriculum! In his opinion, mathematics education for the poor and low achievers has to be revolutionized.

Fletcher, T. J. "Secondary Mathematics Today," Trends in Education, 35: 11-18, October 1974.

According to the ERIC Journal abstract # EJ110295, this article examines the last 12 years in mathematics in secondary schools and considers past achievements and inadequancies in mathematics education and those problems which are to be focused on in the future.

Forbes, Jack E. "Some THoughts on 'Minimal Competencies,' " Mathematics Teacher, 71: 94-100, February 1978.

The author replaces the "negative term" minimal competencies with " mathematical literacy" which he defines as " the ability to solve reasonable simulations of simple real-world

problems involving counting, measurement and percent." (95) In this context he equates mathematical literacy with problem solving. Futhermore, the author feels that "the modern approach did not develop adequate computational skills" and states that recall of basic facts is also an essential part of "mathematical literacy."

Gaslin, William. "A Comparison of Achievement and Attitudes of Students Using Conventional or Calculator Based Algorithms for Operations on Positive Rational Numbers in Ninth Grade General Mathematics," Journal for Research in Mathematics Education, 6: 95-108, March 1975.

Three methods for performing operations on rational numbers were studied using samples of 48 and 53 students: (1) the conventional approach using a text, (2) conventional approach with calculators, (3) an alternative approach by which students changed each fractional operand to a decimal on a calculator. The results showed that the 3rd method proved to be significantly better than the other two, although no difference in attitude was found.

Gast, R. H. "The High School Geometry Controversy: Is Transformational Geometry the Answer?" Mathematics Teacher, 64: 37-40, January 1971.

Gast advocates the inclusion of transformational geometry only in a unified presentation beginning at the elementary school level through senior high school.

Gearhart, George. "What Do Mathematics Teachers Think About the High School Geometry Controversy," Mathematics Teacher, 68: 486-493, October 1975.

Survey of 605 secondary school mathematics teachers' attitudes toward standard Euclidean geometry course verses new curriculum approaches was made in October of 1973. Proposed changes in curriculum included courses based on coordinates, vectors, transformations and non- Euclidean geometry.

Results indicated that teachers were satisfied with the standard one year geometry course although "many teachers would support minor changes in content, such as the addition of coordinates and the increased use of a concrete approach." (492) The survey also concluded that teachers with training in a topic were more interested in its inclusion into the curriculum. Finally, the teachers felt wider dissemination of experimental programs is needed to encourage curriculum reforms.

Graham, J. D. "Materials in a Locally Based Curriculum Development Center," Mathematics in School, 5: 10-12, November 1976.

According to the ERIC Journal abstract # EJ151833, this article focuses on instructional materials for basic geometry concepts for secondary school students.

Grant, N. "Vectors in the Eighth Grade," Mathematics Teacher, 64: 607-613, November 1971.

Grant shows how vectors can be introduced at the end of a first year algebra course in five lessons. The author feels that concepts involving direction and distance help students develop "geometric feeling" much faster than other approaches.

Greenberg, Herbert J. "The objectives of Mathematics Education," Mathematics Teacher, 67: 639-643, November 1974.

Author criticizes behavioral objectives and the influence they have on curriculum development: the basic weekness of behavioral objectives is that they focus on skills not on attitudes and values. He feels that schools should "reassert the primary importance of the values we attach to learning." (643)

Haas, John D. "For Lack of Loom: Problems in Integrating Knowledge," School Science and Mathematics, 75:4-14, January 1975.

Haas states knowledge is interdisciplinary and as such needs another "organizer" for its theories instead of separating it into discipline boundaries (i.e. math, biology, chemistry). He then presents some suggestions for a "loom" which would integrate topics.

Harvey, John G. "Precalculus Mathematics: A Look Through the Big End of the Telescope," Mathematics Teacher, 71: 22-28, January 1978.

The author considers the content included in the beginning calculus courses to establish a "rationale for topics included in the post-geometry, precalculus secondary school mathematics curriculum." (28) Behavioral objectives are listed in the areas of functions, relations, and analytic geometry and linear algebra.

Hawkins, Vincent J. "Some Changes in Shop Mathematics Due to Metrication," Mathematics Teacher, 67: 601-603, November 1974.

Author states that the courses to "feel the impact of metrication the most will be applied mathematics courses" for students seeking jobs in business and industry. Some topics in applied mathematics which he says will be affected: fractions and decimals, technical documentation and communication, mechanics and mechanical drawing, lumber measure, formulas and definitions.

Hershkowitz, Martin, Mohammad A.A. Shami and Thomas E. Rowan. "Mathematics Goals: What Does the Public Want," School Science and Mathematics, 75: 723-728, December 1975.

During the 1971-1972 school year the Maryland State Department of Education conducted a study to identify goals in mathematics which were related to needs of various groups in the community (teachers, parents, business, industry, government officials etc.). Among the conclusions: "Imparting mathematics concepts and skills in and of themselves is of relatively low importance; but if those concepts and skills are presented so that they can be applied to the solution of real life problems then they become of highest importance." (This sets the stage for more applications in the curriculum).

Hestwood, Diana L. and Ross Taylor. " Big Bad Basic Skills - Or What One School System is Doing to Help Low Achievers," Mathematics Teacher, 66: 687-93, December 1973.

This article presents some significant features of the successful "Mathematics Basic Skills Development Project" created for the Minneapolis Public Schools. According to the authors, the outline presented "could serve as a model for similar curriculum development efforts." (688) As of December 1973, the project produced 22 units "covering multiplication, division of whole numbers fractions, decimals, percent, and measurement, (linear, area, volume,liquid, and metric)." (687)

Addresses for more information are also included in the article.

Hight, Donald W., Robert J. Kansky and Don K. Richards. "New Programs," Mathematics Teacher, 66: 538-539, October 1973.

This article briefly describes the latest status on the Comprehensive School Mathematics Program and the newest (1973) efforts of the University of Illinois Committee on School Mathematics. Addresses for more information are listed.

Hill, Shirley. "Issues from the NACOME Report," Mathematics Teacher, 69: 440-446, October 1976.

This article summarizes the analysis of the National Advisory Committee on Mathematics Education in its examination of mathematics education in 1976 and its recommendations for the future. Some of the results of the analysis are as follows: (1) There is a substantial need for improvement in curricula due to decline in math performance in recent years. The committee felt, however, this decline, accompanied by the decline in other subject area performance was not due to the "new math" but to "much broader and societal explanations." (442) (2) The most critical curriculum issues arise from the "back to basics" movement. It was the hope of the committee that educators would be careful not to teach drill without understanding or to consider "skill" before other "mathematics curriculum structures" especially in the light of "calculator availability." (3) The committee realized the great implications of computers and calculators in school mathematics but was concerned that teachers have not responded to the challenges of these technological advances. It was felt that topics such as algebra and geometry should be "revised to reflect emerging capabilities of computers." (443) (4) Educators need to " bridge the gap between the concepts and skills of pure mathematics and the application of these ideas in problem-solving and decision-making situations." (443) (5) More attention must be placed on programs for less able students. (6) "Statistical thinking is crucial," however there exists "a need for more school programs devoted to statistical literacy." (444) (7) Even though there exists varied innovative instructional practices, more research is needed on teaching effectiveness. The committee did feel that teachers have individual teaching styles and as such they should select "those materials which work best at a particular time for a particular group." (444) (8) It was noted that the new math did not change curricular practices on a broad scale and that new methods for in-service teacher education to better implement new programs be developed and supported. (9) The committee realized that the current programs of teacher education are challenged by legislative pressure for competency-based teacher education and certification: "Widespread implementation of CBTE would radically change the character of teacher education, and NACOME takes the position that at this time neither teacher education nor certification should be based solely on such criteria." (445) (10) Student testing is placing an increasing role in educational decision making. It was NACOME's feeling that some forms of this evaluation were inappropriate.

Hirshchi, L. Edwin. "The 'New Math'," Arithmetic Teacher, 24: 241-245, March 1977.

Hirshchi blaims the failure of the "new math" on inadequate training of teachers to teach the innovative programs. He also blaims school administrators and

school boards for adapting programs without giving their teachers opportunity for retraining.

Holland, Margaret, Henry S. Kepner and Charles J. Zoet. "New Products," Mathematics Teacher, 71: 225-229, March 1978.
This article, a monthly feature of the Mathematics Teacher, gives a brief synapse of the new products, articles, films, programs and books in mathematics education. Short summaries of products focusing on basic skills, computers, films, calculators, metric measurement and mathematical games are given. One item of interest in this issue is a set of paperback books called Mathematics for Today, Red Level,(by Saul Katz, Marvin Sherman, Patricia Klagholz and Jack Richman, 1975) Blue Level (by Ed Williams, Saul Katz, and Patricia Klazholz, 1976), which presents a program in which students may work on a variety of mathematics problems found to be a "routine part of adult life." Topics mentioned include: "Try a Job," "Restaurant Math," "Number Patterns and Calculators," "Sports Math," "automobile Math," "Learning a Checking Account," "Supermarket Math," "Buying Intelligently," "Your Job and Your Pay," "Statistics and Probability," and Selling as a Career." Activity books offer practical examples of math problems students will encounter in today's world.

How to Use ERIC: Science, Mathematics, and Environmental Education: ERIC Clearinghouse for Science, Mathematics and Environmental Education. Columbus Ohio: Ohio State University, February 1978.
This paper is a basic quide to use the Educational Resources Information Center.

Howden, B. "Computer Page: Data Processing in Computer Studies," Mathematics in School, 4: 23-24, November 1975.
According to the ERIC Journal abstract # EJ130232, Howden advocates the inclusion of data processing in computer science courses. Examples of data processing for classroom use are given.

Jackson, Stanley B. "Applications of Transformations to Topics in Elementary Geometry: Part 1," Mathematics Teacher, 68: 554-562, November 1975.
Jackson introduces "simple" transformations which can be applied to standard geometric topics.

Jackson, Stanley B. "Applications of Transformations to Topics in Elementary Geometry: Part II," Mathematics Teacher, 68: 630-635, December 1975.
A continuation of part I presented in the November, 1975 issue.

Joiner, Brian L. and Cathy Campbell, "Some Interesting Examples for Teaching Statistics," Mathematics Teacher, 68: 364-369, May 1975.
This article provides excellent ideas to expose students to statistics and a fine list of sources for reading for teachers.

Jordan, James H. "A Way Mathematicians Can Meaningfully Contribute to Pre-College Mathematical Training," American Mathematical Monthly, 84: 731-736, November 1977.
This article describes a project sponsored by the National Science Foundation to conduct an experiment involving mathematicians entering the classrooms (elementary, junior and senior high schools) to see if they could contribute to solutions of problems of mathematics education. Rationales, activities and reactions to the project are described.

Kaner, Peter. "Maths for the Majority Continuation Project," Mathematics in School, 1: 1-18, November 1971.

According to ERIC Journal abstract # EJ057208, this article provides "a description of projects designed to produce mathematics teaching materials for the lowest forty percentile ability group, based on a study of the environment."

Kapadia, Ramesh. "Curriculum Development: Practice and Theory," Educational Studies in Mathematics, 8: 199-210, August 1977.

According to the ERIC Journal abstract # EJ174194, this article elaborates on the "place of Euclidean Deductive Geometry in the secondary school curriculum."

Kaufman, Burt A. "Brief Description of the Elements of Mathematics Program: Comprehensive School Mathematics Program," St. Louis, Missouri: CEMREL, Inc., September 1976.

Kaufman, the director of the Comprehensive School Mathematics Program, briefly describes the goals and content of the "EM" program for gifted secondary school students.

Kilpatrick, Jeremy. "Research on Problem Solving in Mathematics," School Science and Mathematics, 78: 189-192, March 1978.

Kilpatrick criticizes past research literature on problem solving. He states the exercises used in various studies were too routine and easy. The author feels that "instructional programs that demonstrate how heuristic techniques can be used to solve complex mathematical problems and then provide guidance in applying these techniques show promise both for research and for practice." (192)

Kindergarten - Twelve Mathematics Program Baseline, Field Test Copy, Appendix A, Dallas Texas: Dallas Independent School District, 1975.

According to ERIC Document abstract # ED134429, this paper discusses the program goals and outlines for the K-12 mathematics curriculum for the Dallas Independent School District. Textbook lists and objectives for each grade are also included.

Kline, Morris. "NACOME: Implications for Curriculum Design," Mathematics Teacher, 69: 449-454, October 1976.

On the whole, Kline praises the NACOME report: He agrees with its recommendations that more stress should be placed on applications of mathematics; there is more need to take computers and calculators "into account"; there exists the necessity of including probability and statistics into the curriculum.

He does, however, express some criticism of the report: (1) His own study of the major curriculum programs reflects that "with the exceptions of the Madison Project and the aborted Minnemast Project the reformers played the game of follow the leader." (450) (2) New math groups should have been criticized on the ground that they did not test their curricula on a broad scale. (3) He does not think the new math espoused discovery at the secondary level. (4) He feels the teaching of abstract algebraic structures such as groups, fields is "inadvisable." (5) It is Kline's opinion that mathematics is understood intuitively and that logic is "entirely subordinate." As such, the intuitive approach and not the logical approach should be used by teachers.

Kline's recommendations are as follows: (1) Real curriculum reform must be founded on new premises since only 2.5% of the high school students need the technical mathematics we now teach. (2) Educators need to question the values of algebra,

geometry and trigonometry for the other 97.5 percent. (3) Finally, "mathematics will reach only a tiny fraction of the present high school student body until we fashion courses that are valuable to all students. The key to such courses is that the significance of any mathematics we teach must be presented along with the mathematics proper." (453)

Kline, Morris. Why Johnny Can't Add: The Failure of the New Math, New York: St. Martin's Press, 1973.

Since this excellent source could not be located from which to annotate, the following excerpt is taken from Frederick Bell's text, Teaching and Learning Mathematics in Secondary Schools: "Kline's book contains his view that new math is a failure. He briefly discusses the nature of modern mathematics, origins of the new math curriculum movement, the content of the new math curriculum and recommendations for improving the school mathematics curriculum."(92)

Kolata, Gina Bari. "Aftermath of the New Math: Its Originators Defend It," Science, 195.4281: 854-857, March 1977.

According to ERIC Journal abstract # EJ155811, Kolata states that most new math programs were never correctly implemented; that scores on aptitude tests were lower not only in math but also in verbal ability and that math concepts have not been learned in either new math or traditional curricula.

Krauss, Peter A. and Steven L. Okolica. "Neutral and Non-Euclidean Geometry: A High School Course," Mathematics Teacher, 70: 310-314, April 1977.

This article briefly describes a one term course at the John Dewey High School in Brooklyn on Non-Euclidean Geometry. The course is separated into three parts: Neutral Geometry, Lobachevskian Geometry, and Riemannian Geometry, and is open to any student who has completed at least the first half of the tenth grade Euclidean Geometry course.

Kraus, William H. "Bach to Basics: Friend or Foe?" Mathematics Teacher, 71: 218-223, March 1978.

This article summarizes and offers solutions to issues concerning the "Back to Basic" movement in the U.S. Kraus disputes the criticism of the new math as it is epitomized in Morris Kline's book, Why Johnny Can't Add: The Failure of the New Math. He also states that the "new math" of the sixties was not that substantially different than that of the fifties. What was different, however, was that math of the sixties was "taught as a logical entity rather than as a bag of tricks." (220) He doesn't hesitate to point out the flaws of the curricula of the sixties, but also says that many of the mistakes are being corrected: More drill is provided, set theory is now taught as a tool to teach other math ideas rather than an entity itself, there is a concentration on math curriculum to make it more meaningful to the student.

Kraus feels that the decline in student tests scores is due to "both a decline in academic standards and a decline in standards of discipline." But he is reserved about the suggestions of the back to basics movement to create a "fundamental school" that maintains high academic and discipline standards and requires pupils to pass minimum competencey examinations. He feels the solution to the problem of standards falls primarily on the teachers. That only by joining forces with the back to basics movement will the

teachers insure that the overall effect of the movement will be constructive rather than destructive.

Leithwood, K.A. and others. Curriculum Change at the System Level: A Four Year Mathematics Project, Washington D.C.: American Educational Research Association, March 1975.

According to ERIC document abstract # ED106141, this paper describes the Peterborough County Board of Education Mathematics Project "aimed primarily at basic skills and problem solving in grades K-10." Curriculum constructs are examined with focus on "implementation as part of the curriculum design." Consideration is given to changes made by teachers as part of the development of the materials.

Lockard, J. David (Editor). Seventh Report of the International Clearinghouse on Science and Mathematics Curricular Developments 1970, University of Maryland: American Association for the Advancement of Science and the Science Teaching Center, University of Maryland, 1970.

Since this excellent source could not be found to directly annotate from it, the followingannotation is taken from Federick Bell's text, Teaching and Learning Mathematics in Secondary Schools: "This clearinghouse publication, which is revised and updated every two years, contains descriptions of many of the major (and not so major) science and mathematics curriculum development projects in the world. This is a convenient reference for mathematics teachers interested in where the current mathematics curriculum projects are located and what materials have been produced by each project." (93)

Lomon, E.L., B. Beck, and C.A. Arbetter. "Real Problem Solving in USMES: Interdisciplinary Education and Much More," School Science and Mathematics, 75: 53-64, January 1975.

Although the Unified Science and Mathematics for Elementary Schools (USMES) program is geared for the lower grades, advantages that a problem solving curriculum has with respect to interdisciplinary education are listed and can be applied to secondary school education.

Long, Thomas E. and Edwin L. Herr. "Teacher Perceptions of Basic Mathematics Skills Needs in Secondary Vocational Education," Mathematics Teacher, 66: 61-66, January 1973.

A random sample of 260 vocational education teachers completed a questionnaire to identify which of 66 basic mathematical skills are requisite to success in vocational education courses and those skills in which students are least prepared.

This report analizes the results of the questionnaire.

Lorch, Edgar R. "Rated X for Mathematical Minors," Mathematics Teacher, 70: 744-749, December 1977.

Lorch proposes curriculum ideas for pre-calculus courses. He states concepts such as mantissas, radicands, synthetic division, conditional equations should be "played down" since they have no role in future mathematics. The author stresses algebra, polynomials, series, limits, exponents and logarithms and circular functions for the precalculus course and presents some ideas on the level of difficulty to which students should be taught.

Machlowitz, Eleanore. "Electronic Calculators-Friend or Foe of Instruction?" Mathematics Teacher, 69: 104-106, February 1976.

The author highly recommends the use of calculators in the classroom, gives a number of ideas on how they help pupils learn math inductively, and includes some references on their purchase.

Massey, Tom E. and Totsye J. Conner. "A Report on a Tested Alternative to the Traditional High School Geometry Course, Research Monograph No. 21," Gainesville, Florida: Florida University, P.K. Young Laboratory School, May 1977.

According to ERIC Document abstract # ED144841, this paper reports on a one semester geometry course which contains traditional content without rigorous axiomatic structure. Data from 75 pupils "indicated that they achieved at least as well as normative groups on the cooperative...geometry test."

"Mathematical Needs of a Level Physics Students," Physics Education, 8: 241-246, June 1973.

According to the ERIC Journal abstract #EJ079142, this article suggests mathematical requirements for students to learn "sixth form physics and subsequent advanced courses."

Mathematics K-12, Geometry. Utica City School District Articulated Curriculum: Project Search, 1975, Washington D.C.: Bureau of Elementary and Secondary Education (DHEW/OE), 1975.

According to ERIC Document abstract ED125919 this paper "is one of six which set forth the mathematics components of the project search articulated curriculum developed by the Utica (N.Y.) City School District. Each volume deals with a broad area of mathematics and lists objectives related to that area for all grades from K-12. Each objective listed is described in general terms and then in terms of specific skills which students should exhibit." This volume concerns geometric concepts, theorems and methods, including trigonometry, and a few topics from calculus.

Mathematics K-12, Measurement: Utica City School District Articulated Curriculum: Project Search, 1975, Washington D.C.: Bureau of Elementary and Secondary Education (DHEW/OE), 1975.

According to ERIC Document abstract #ED125920, this volume "covers topics related to measurement. These include money, calendar, time, temperature, weight, linear measure, liquid measure, area and volume, error of measurement, and techniques of graphing and interpreting graphs. Both metric and English systems of measurement are used."

Mathematics K-12, Number and Numeration. Utica City School District Articulated Curriculum: Project Se rch, 1975, Washington D.C.: Bureau of Elementary and Secondary Education, (DHEW/OE), 1975.

According to ERIC Document abstract # ED125921, "this volume concerns numbers and systems of numeration. The topics range from counting and recognition of numerals at the early levels to use of nondecimal systems, permutations and combinations and interpretation of percents at upper levels."

Mathematics K-12, Operations. Utica City School District Articulated Curriculum: Project Search, 1975, Washington D.C.: Bureau of Elementary and Secondary Education (DHEW/OE), 1975.

According to ERIC document abstract #ED125922 this volume focuses on computation and operations with whole numbers, fractions decimals and algebra for grades 9-12.

Mathematics K-12, Problem Solving. Utica City School District Articulated Curriculum: Project Search, 1975, Washington D.C.: Bureau of Elementary and Secondary Education (DHEW/OE), 1975.

According to ERIC Document abstract # ED125923, "this volume addresses techniques of solving problems throughout the curriculum."

Mathematics K-12, Sets. Utica City School District Articulated Curriculum: Project Search, 1975, Washington D.C.: Bureau of Elementary and Secondary Education (DHEW/OE), 1975.
According to ERIC Document abstract # ED125918, "the objectives listed in this volume are related to the development of set theoretic language, symbolism, and usage. In addition, high school objectives concerning probability and sets related to the definition of functions are included."

Mathematics 7-8 Handbook, Albany, New York: Bureau of General Education Curriculum Development, 1976.
According to Eric Document abstract # ED141115, this handbook provides an outline of twelve units for 7th and 8th grade mathematics courses. For each unit there is a description of student needs, important concepts, learning activities, and enrichment activities. The unit titles are: Sets, Systems of Numeration, Natural Numbers, Whole Numbers, Positive Rationals, Integers, The Complete Set of Rationals, Reals, Ratio and Related Topics, Geometry, Statistics and Probability.

McCully, Ron. "Basic Skills Program," Mathematics Teacher, 71: 113-116, February 1978.
Describes a program in Phoenix Union High School District on basic skills improvement in which there is "no major curriculum upheaval."

Meserve, Bruce E. "An Improved Year of Geometry," Mathematics Teacher, 65: 103, 176-181, February 1972.
Meserve feels that there should be a year long course that is primarily geometric which also includes algebraic approaches to geometric concepts (transformational geometry, coordinate geometry). The author also focuses on student exploration with models (paper folding) in addition to formal proofs. He seems to emphasize variety in the geometry course.

Moise, Edwin E. "The Meaning of Euclidean Geometry in School Mathematics," Mathematics Teacher, 68: 472-477, October 1975.
Moise is a proponent of Euclidean geometry in high school mathematics curriculum for the following reasons: it's the only subject young students can work with in the same way as a mathematician; geometry is the study of ideas which don't lead to algorithms (processes of solving problems sometimes replaces the problem itself in a student's mind); it is the knowledge of geometry which "rescues other mathematical topics from meaningless formalism;" and finally "geometry is one of the best examples of a system of coherence and order inherent in scientific thought." (477)

Montague, Margariete, Mary Margaret Odom and Alexander Tobin. "New Programs," Mathematics Teacher, 68: 693-694, December 1975.
This article briefly describes the "Biomedical Interdisciplinary Curriculum Project," a two year curriculum for 11th and 12th grades in mathematics, science and social sciences. The program is geared for the above average student in mathematics and "designed to offer an alternative that is between the traditional college prep courses and the voactional courses."

Montague, Margariete A., Mary Margaret Odom and Alexander Tobin. "New Programs," Mathematics Teacher, 69: 83-84, January 1977.
The editors describe a curriculum for slow learners called MATHSCI which integrates mathematics and science.

Mosteller, Frederick. "Progress Report of the Joint Committee of the American Statistical Association and the National Council of Teachers of Mathematics," Mathematics Teacher, 63: 199-208, March 1970.

Development of a source book of examples in statistics as well as a book of applications of statistics and probability is discussed. Examples of problems which might appear in these books are shown. They are entitled "analysis of collegiate football scores," "ratings of typewriters," and "local frequency of primes."

Moursund, David. "Selecting Goals for an Introductory Computer Programming Course," Mathematics Teacher, 66: 599-603, November 1973.

Moursund elaborates on general goals for computer programming in the secondary school. Among these goals are more teacher training, development of students' problem solving skills, the familiarization of the capabilities and limitations of the computer, the teaching of computer programming so that students can gain skills they need for personal use.

Munson, Howard R. "Your District Needs a Policy on Pocket Calculators," Arithmetic Teacher, 25: 46, October 1977.

Munson gives some criteria for implementing calculators in schools.

National Council of Teachers of Mathematics: Special Issue of the Mathematics Teacher: Computers and Calculators, Reston, Virginia: National Council of Teachers of Mathematics, 71, May 1978.

This issue provides current literature on computers and calculators. Also included are position statements of the Board of Directors of NCTM on the use of minicalculators and computers in the classroom (468).

National Council of Teachers of Mathematics: A Special Issue of the Mathematics Teacher: Minimum Competencey, Reston, Virginia: N.C.T.M., 71, February 1978.

This special issue of the Mathematics Teacher focuses on basic mathematical skills, objectives, construction of tests of basic competencies and the implementation of changes in the curriculum. Some articles presented are listed separately in this bibliography.

National Council of Teachers of Mathematics Instructional Affairs Committee. "Minicalculators in Schools," Mathematics Teacher, 69: 92-94, January 1976.

This article lists justifications and provides examples for the uses of minicalculators in the classroom.

National Council of Teachers of Mathematics Metric Implementation Committee. "Metric Competency Goals," Mathematics Teacher, 69: 90-91, January 1976.

This provides a standard guide as to what students should be learning about the metric system. The article lists competencies for 3rd, 6th, and 9th grades so that teachers may better plan their instructional programs.

Offner, Carl D. "Back-to-Basics in Mathematics: An Educational Fraud," Mathematics Teacher, 71: 211-217, March 1978.

Offner states that mathematics "gives us a way of describing and understanding the world we live in." (217) He therefore sees the back-to-basics movement as an educational crime. He believes that "rote-learning" and "mindless pencil-pushing drill" is no substitute for understanding. He contests

the fact that the traditional "old" way of teaching basic math skills was effective in that many adults (who learned by this method) can't do their income tax returns, must rely on pocket calculators for usage of percent, and can't help their own children to solve word problems. He suggests that what is needed is the best of both modern and traditional mathematics to better describe the world we live in.

Ost, David H. "Changing Curriculum Patterns in Science, Mathematics and Social Studies," School Science and Mathematics, 75: 48-52, January 1975.

Ost defines the "new" terminology applied to current curriculum projects.

Pass, Norman. "Using the MMCP Packs," Mathematics in School, 4: 5-6, November 1975.

According to this ERIC Journal abstract # EJ130225, this article presents a description of the "twelve curricular packets developed by the Mathematics for the Majority Continuation Project." Objectives, materials and methods of the project are discussed.

Pereira-Mendoza, Lionel and Maxfield Robbins. "A Study of the Objectives of High School Geometry as Perceived by Teachers and University Mathematics Educators," School Science and Mathematics, 77: 189-195, March 1977.

This study sampled 25 mathematics educators(from U.S. and Canada) and 60 geometry teachers (from Canada) on the rating of 35 objectives of high school geometry.

Among the conclusions: "teachers tend to feel that knowledge/comprehension objectives are more important, whilst educators favor analysis/synthesis." (194) Another difference is that teachers rated practical applications number one while the educators rated application very low.

The authors concluded that since there is a communication gap between educators and teachers on the objectives of high school geometry, renewed efforts to exchange views and ideas on curriculum should be made. In addition, more applications should be included in geometry texts.

Pollak, Henry O. "Hand-Held Calculators and Potential Redesign of the School Mathematics Curriculum," Mathematics Teacher, 70: 293-296, April 1977.

Pollak gives beautiful suggestions on how to best implement the calculator in the mathematics curriculum. He asks the question: "What are some of the most difficult problems we have in teaching school mathematics with which the calculator might help?" Some examples he gives as answers to this question include teaching functions and inverse functions, iteration methods for solving simultaneous linear equations, statistics and probability.

Price, Camille C. "Microcomputers in the Classroom," Mathematics Teacher, 71: 425-427, May 1978.

This article elaborates on the advantages of the microcomputers.

"Promising Programs and Practices," National Council of Teachers of Mathematics Yearbook 35: The Slow Learner in Mathematics, Washington D.C.: N.C.T.M., 345-348, 1972.

This article provides a list of addresses of developing programs on the slow learner.

"Project MEGSSS: Description and Rationale," Comprehensive School Mathematics Program, St. Louis, Missouri: CEMREL, Inc., 1978.

This paper briefly describes MEGSSS which stands for

Mathematics Education for Gifted Secondary School Students, "a proposed three part project consisting of a math center and curriculum for students, an inservice training component for teachers, and a model for replication throughout the country." The curriculum is the "Elements of Mathematics" program (included in this bibliography), the center is at CEMREL, a national educational laboratory in St. Louis. Included in this paper is a list of college credits given toward completion of "EM" books, proceedings for student selection,, brief statements as to purposes and means for inservice training of teachers, a description of MEGSSS role as a model replicable in areas of a sufficient gifted population and the advantages of the EM program over other programs for the gifted including SSMCIS.

Rao, C. Radhakrishna. "Teaching of Statistics at the Secondary Level: an Interdisciplinary Approach," International Journal of Mathematical Education in Science and Technology, 6: 151-162, May 1975

The following is the ERIC Journal abstract #EJ124839 on this article: "A syllabus is proposed for a course in statistics at the secondary level. Brief comments are given on each topic indicating how they may be presented to students. The overall approach to teaching statistics from an interdisciplinary point of view is discussed."

Rappaport, David. "The New Math and Its Aftermath," School Science and Mathematics, 76: 563-570, November 1976.

Rappaport presents an analysis of reactions to school mathematics curriculum i.e. new math verses the tradtional math. He describes viewpoints of both the proponents and critics and proposes a solution that the new math should remain for 40% of the children who are capable of doing it and "for the 60% who are frustrated by the new math, a return to the study of the basic arithmetic skills is in order." (568)

Report of the Conference On Needed Research and Development on Hand-Held Calculators in School Mathematics, Washington D.C.: National Science Foundation and the National Institute of Education, 1976.

This 54 page report summarizes the suggestions of the conference committee composed of 13 individuals (including Max Bell, Henry Pollak, Marilyn Suydam) on the use of calculators in the school.

The committee agreed that the impact of calculators in the United States is considerable: "80 million calculators will be in use by 1980." Therefore a program on calculators is a necessity. The guidelines for research on curriculum development include a commitment to comprehensive math education for everyone; expectations of every student to have skills without the use of a calculator (these skills are listed); research teams should include teachers, math educators, mathematicians, evaluation specialists for proper assessment; research proposals should be explicit and conducted under proper investigative conditions; implementation of research should be well designed; development of an information base to determine whether or not existing curriculum can be adapted for use with calculators should be established; materials should be developed for the immediate future to use the calculator as a teaching tool in areas such as estimation, significant digits, order of magnitude, problem solving and algorithmic processes; curriculum development for the long range future include

alternatives the calculator provides to broaden the range of math ideas; there should be training of teachers on calculator materials and finally there should be a central information collection and dissemination center to inform teachers and the public as to the progress of the schools' adaptation to the use of calculators.

Rogers, Sandra. Laboratory Mathematics. Booklet I: Teacher's Management Guide: Anderson County School District #2, Honea Path, S.C. Washington D.C. Bureau of Elementary and Secondary Education (DHEW/OE), ERIC Document #141-167, November 1977.

Rogers describes the mathematics laboratory project designed for those students who are significantly below their expected achievement level in mathematics. The approach involves the use of materials such as taped lessons, games, curriculum booklets and manipulatives. The laboratory method, organization of the lab, supervision of the lab, a flowchart of the curriculum booklet process, examples of pretests, tests, teacher guides, and a materials list are included in this paper.

Although this project is designed for the elementary grades, it provides an excellent guideline for remedial work for more advanced grades.

Rowan, Thomas E. "Metrication in a Local Education Agency," American Metric Journal, 5, #2: 59-60, 1977.

According to ERIC Journal abstract # EJ157465, this article presents "a school system's planning for metrication." "Community relations, curriculum, teaching methods, and inservice education are covered in this first section."

Sawyer, W.W. "The Case for Fractions," Mathematics in School, 6: 16-17, January 1977.

According to ERIC Journal abstract #EJ162885, "in response to an earlier article advocating the elimination of fractions from the curriculum, the author argues for their retention. He points out examples of their use in music and physics, and discusses methods of presenting operations on fractions."

Schofield, R. and C.F. Winter. "Physics and Mathematics in the Sixth Form," Physics Education, 10: 341-344, July 1975.

According to the ERIC Journal abstract #EJ126567, this article "examines the justifications for the school curriculum and the distinguishing characteristics of physics and mathematics."

School Mathematics Study Group. Newsletter No. 36: Final Report on a New Curriculum Project, Stanford, California: School Mathematics Study Group, February 1972.

The development, goals, features, and chapter titles of the "Secondary School Mathematics Program" for junior high school students is presented.

School Mathematics Study Group. Newsletter 38: Section 1: An SMSG Statement on Objectives in Mathematics Education, Section II: Minimum Goals for Mathematics Education, Stanford, California: School Mathematics Study Group, August 1972.

Summary statements of the goals of the Secondary School Mathematics Program by S.M.S.G. for each chapter are included in this newsletter. There are 28 chapters in this program. Their titles are: Structuring Space; Functions; Informal Algorithms and Flow Charts; Problem Formulation; The Integers; The Rational Numbers; Congruence; Equations and Inequalities;

Decimal Representation of Rational Numbers; Probability; Measurement; Perpendiculars and Parallels; Similarity; The Real Numbers; Second Look at Measurement; Perpendiculars and Parallels (II); Coordinate Geometry; Problem Solving; Solution Sets of Mathematical Sentences; Rigid Motions and Vectors; Computers and Programming; Quadratic Functions; Statistics; Systems of Sentences in Two Variables; Exponents and Logarithms; Logic; Probability and Statistics.

School Mathematics Study Group, Newsletter No. 43: Final Publication List, Stanford, California: School Mathematics Study Group, August 1976.

Although S.M.S.G. no longer publishes, this is a list of those books and materials which can now be duplicated without permission from S.M.S.G.

Schultz, James E. "How Calculators Give Rise to a New Need for Skills in Algebra," School Science and Mathematics, 78: 131-134, February 1978.

Schultz provides examples of algebraic manipulations which simplify the usage of a calculator by "eliminating unnecessary storage of data," "reducing steps to obtain an answer" and "making computations possible which might otherwise overflow." (134)

Secondary School Mathematics Curriculum Improvement Study: Information Bulletin 5: Why a New Program in Mathematics, New York: Columbia University, November 1970.

According to this report, mathematicians and mathematical educators throughout the world see contemporary mathematics as a "study of 'sets and structures' and activities derived therefrom." (7) Their point of view is that the study of mathematics should be unified and coordinated. For example, algebraic structures in the curriculum should grow in complexity from the concrete, to operational systems, to groups, fields and vector spaces. The study of geometry should include groups of transformations, mappings, affine and Euclidean space as well as trigonometry and conic sections.

Included in this report is a sequence of chapters in the SSMCIS program (12-13) which exemplify a unified approach along with a list of those schools and teachers who have implemented the program. (14-15)

Sharp, Neil F. "Accelerated Mathematics- What's Going Wrong?" National Association of Secondary School Principals Bulletin, 59: 94-99, October 1975.

The author examines causes of the high attrition rate in accelerated mathematics programs of the Long Island, N.Y. secondary schools.

Skypek, Dora Helen. "The Training of Teachers," National Council of Teachers of Mathematics Yearbook 35: The Slow Learner in Mathematics, Washington D.C.: N.C.T.M., 402-443, 1972.

The author discusses teacher learning projects which include curriculum development for the slow learner.

Sorge, D.H. and G. H. Wheatley. "Calculus in High School-At What Cost," American Mathematical Monthly, 84: 644-647, October 1977.

A survey was conducted at Purdue University as to the math prepartion of entering Calculus students from the years 1969-1975. "Results of classroom experiences and of the survey indicate that trigonometry and analytic geometry are either being slighted in many high schools in favor of calculus or they are being taught in such a way that students entering

the university require remediation in these areas."

Spencer, Donald D. A Guide to Teaching About Computers In Secondary Schools, Ormond Beach, Florida: Abacus Computer Corporation, 1973.

This is a superb handbook on computers for secondary school teachers. It describes how computers are used in the secondary school curriculum in the subject areas of algebra, geometry, chemistry, physics, trigonometry, probability and statistics, and junior high mathematics. Emphasis is placed on problem solving using the computer and specific examples are given. Included are suggestions and methods for enabling teachers to integrate computer training into the curriculum.

Stanley, Julian C. "The Student Gifted in Mathematics and Science," National Association of Secondary School Principals Bulletin, 60: 28-37, March 1976.

Stanley describes the Study of Mathematically Precocious Youth (SYMPY) at Johns Hopkins University. Examples of student programs are provided.

"Status Report: Mathematics Curriculum - Development Projects Today," Arithmetic Teacher, 19: 391-395, May 1972.

With emphasis on primary grades, the following projects are discussed briefly: Cambridge Conference on School Mathematics; Comprehensive School Mathematics Program; Computer-Assisted Instruction Program at Stanford; Individually Prescribed Instruction Project; Madison Project; Mathematics/Science Learning System; Minnemast; School Mathematics Study Group. (Project directors and addresses are also included in this report.)

Steven, John G. and Robert Garfunkel. "Summary and Curricular Implications: An Outgrowth of Articles by Thom and Diedudonné," Mathematics Teacher, 68: 683-687, December 1975.

The authors attempt to summarize comments by the famous mathematician René Thom and the reactions of the world famous mathematician Jean Dieudonné on modern mathematics education. Stevens and Garfunkel then emphasize points of agreement between the two famous men. They are: the importance of Euclidean Geometry in the mathematics curriculum; the importance of avoiding needless abstraction (groups, rings,etc.); the emphasis on the strategy of proof.

Suydam, Marilyn N. and J. F. Weaver. "Research on Mathematics Education Reported in 1975," Journal for Research in Mathematics Education, 7: 193-257, July 1976.

This report is the sixth annual listing of research on mathematics education. The listing includes research summaries, journal-published reports, and dissertation abstracts for grades K-12. Each published study is annotated with its major finding. Also order numbers are assigned to the dissertations so that one may obtain them by writing to University Microfilms International-Dissertation Copies, P.O. Box 1764, Ann Arbor, Michigan, 48106.

Suydam, Marilyn N. and J.F. Weaver, "Research on Mathematics Education Reported in 1976," Journal for Research in Mathematics Education, 8: 243-316, July 1977.

This is the seventh annual listing of research summaries, journal-published reports and dissertation abstracts made in 1975. Annotations indicate major finding of each study pertaining

to elementary and secondary school mathematics.

Suydam, Marilyn N. and J.F. Weaver. "Research on Mathematics Education Reported in 1977," Journal for Research in Mathematics Education, 9: 243-319, July 1978.

This eighth annual listing of the Journal provides an index of research summaries, journal-published reports and dissertation abstracts made in 1977. All published articles are briefly annotated. In this particular issue an index of general topics is appended to help readers locate studies under subject headings.

Tan, Sinforosa G. and Tom R. Vickery. "Agreement by Secondary and Postsecondary Faculty on the Content of High School Geometry," New York, New York: American Educational Research Association, April 1977. (ERIC Document 139661)

This is a study of the opinions of 426 secondary and postsecondary teachers on what should be included in the secondary school geometry curriculum. Fourteen topics were included in the questionnaire which was given to the faculty twice. The second time around a record of a subject's responses along with a record of the percentages of positive responses by the other subjects was presented to allow the individual to change his mind. Nevertheless there was significant disagreement between the secondary school geometry teachers and postsecondary faculty as to what ought to be included in high school geometry on ten of the fourteen topics. Statistical tables and justifications and discussions of results are included in this paper.

Taylor, Ross. "NACOME: Implications for Teaching K-12," Mathematics Teacher, 69: 458-463, October 1976.

Taylor is in major agreement with the NACOME report. His basic criticism lies with the "amount of emphasis that is given to various ideas." (463)

He feels the report should have emphasized to a greater degree: problem solving, means of power and maintenance to operate calculators, computers in non-mathematics courses, minority students in mathematics and curriculum development in geometry. Taylor also felt that the report overemphasized the impact of federally funded projects and underemphasized the impact of commercially and locally developed materials.

Taylor, Ross. "The Question of Minimum Competency as Viewed from the Schools," Mathematics Teacher, 71: 88-93, February 1978.

Taylor uses the term "basic skills" in a broad sence and distinguishes it from "minimal competency" which should only be applied to a specific context. He talks about criterion-reference testing, along with techniques such as observation, questionnaires and performance of certain tasks used in assessing basic skills and attitudes. He also forsees more mathematics courses in basic skills and consumer skills and states curriculum development in basic mathematical skills is urgently needed.

Tobin, Alexander. "Guidelines Regarding the Use of the Mini-Calculator in the Classroom," Philadelphia, Pennsylvania: The School District of Philadelphia, Office of Curriculum, Division of Mathematics Education, File #260, September 1977.

This paper provides practical guidelines for the use of calculators in schools.

Tobin, Alexander. "Mini-Calculator Project Fact Sheet," Philadelphia, Pennsylvania: The School District of Philadelphia, Office of Curriculum, Division of Mathematics Education,

File #260, December, 1976.

This paper describes (briefly) a mini-calculator project for ninth grade general mathematics students "to determine the effect of using minicalculators and an associated curriculum supplement on computational skills and attitudes toward mathematics."

Trafton, Paul R. and Marilyn N. Suydam. "Computational Skills: A Point of View," Arithmetic Teacher, 22: 528-537, November 1975.

The authors discuss the role of computation in the mathematics curriculum. They feel that there are "three facets of the mathematics program" which educators should examine: "the appropriate time for introducting computational topics," "the appropriate computational algorithms," and finally, "the appropriate rate and type of reinforcement of computational skills, and the appropriate level of competency to expect." (537)

Travers, Kenneth J., John W. LeDuc and Garth E. Runion. Putting Research into Educational Practice Report No. 30: Teaching Resources for Low Achieving Mathematics Classes, Washington D.C.: U.S. Government Printing Office, August 1972.

This booklet presents characteristics of low achievers in mathematics, activity learning for low achievers including use of computers and calculators, and curriculum considerations for low achievers. Also included are administrative guidelines for implementing new curriculum as well as a bibliography of general resource material.

"Trends in the Teaching of Mathematics," Skokie, Illinois: National Textbook Company, 1977.

Two Hundred Ninty Three mathematics supervisors acroes the nation completed a questionnaire on their observations on 30 selected trends in mathematics over the past five years and to project their expectation for these trends over the next five years. Some curriculum implications of changing trends include: (1) Supervisors see the use of electronic calculators as holding its position of importance, rank #3. (2) While supervisors still expect a present increase in the use of manipulative materials (games, puzzles), they expect trends to decelerate eventually over the next five years. (3) Practical application of mathematics is expected to greatly increase in importance. (4) Calculator computation is expected to greatly increase in emphasis while the use of drill exercises is expected in increase at a slower rate. (5) A substantial increase in emphasis on computer programming is forecast along with coordination between high, junior high, and elementary school math programs. (6) Areas of greatest decreasing trends include, slide rule computation, solid geometry and emphasis on theorems and proofs.

Troutman, Andria P. and Betty P. Lichtenberg. "Problem Solving in the General Mathematics Classroom," Mathematics Teacher, 67: 590-597, November 1974.

This article describes seven abilities needed for problem solving in the general mathematics class as well as five activities which help to develop those seven specific abilities.

Tunis, Harry. "Career Education-Out With the New Math," School Science and Mathematics, 78: 142-146, February 1978.

Tunis elaborates on the positive and negative effects of recent emphasis on career education on mathematics curriculum.

Turner, A.D. "Nuffield 'Science Uses Mathematics' Continuation Project," Education in Science, 66: 17-18, January 1976.
According to the ERIC Journal abstract #EJ139869, this article describes the Nuffield Project which elaborates on topics in science curriculum which involve mathematics.

Usiskin, Zalmon. "Applications of Groups and Isomorphic Groups to Topics in the Standard Curriculum, Grades 9-11: Part I," Mathematics Teacher, 68: 99-106, February 1975.
Usiskin presents relationships between groups and topics in secondary school mathematics as a case for the inclusion of the study of groups into the curriculum of the "average" college-bound student. Included in this article are applications of groups to sentence solving, "systems," and real and complex number operations.

Usiskin, Zalmon. "Applications of Groups and Isomorphic Groups to Topics in the Standard Curriculum, Grades 9-11: Part II," Mathematics Teacher, 68: 235-246, March 1975.
This is a continuation of Part I. Contained in this article are applications of groups to properties of powers, multiples, logarithms, congruence, similarity, symmetry, and the trigonometric functions.

Usiskin, Zalmon. "Are Calculators a Crutch," Mathematics Teacher, 71: 412-413, May 1978.
Usiskin discusses the crutch premise that student use of calculators might lead to the inability to do calculations by hand. He takes the viewpoint that a "crutch" is not necessarily a bad thing; i.e. society relies on crutches such as business machines, cash registers and computers to its advantage. He feels that emphasis should be put on how to solve problems rather than whether or not the calculations are done by hand.

Usiskin, Zalmon P. "The Case for Transformations in High School Geometry," (This article was sent by the author and was adapted from two talks given at the Conference for Advancement of Mathematics Training, at Austin, Texas).
Usiskin elaborates on five reasons as to the inclusion of transformations in the geometry curricula: (1) "Transformations enable one to deal with a much greater variety of figures in geometry." (2) "Transformations bring geometry much closer to the intuition of the child." (3) "Transformations make goemetry more accessible to the slower student." (4) "Transformations provide assistance for future work in mathematics." (5) "Transformations give a unifying concept to the geometry course which is geometric in nature."

Vervoort, Gerardus. "Inching Our Way Toward the Metric System," Mathematics Teacher, 66: 297-302, April 1973.
Vervoort gives an historical perspective of the metric system and reasons for its incorporation into the mathematics curriculum.

Vollrath, H.J. "The Place of Geometry in Mathematics Teaching: An Analysis of Recent Developments," Educational Studies in Mathematics, 7: 431-442, December 1976.
According to ERIC Journal abstract # EJ155793, "seven different views of geometry are identified, and for each of the views, guidelines for designing individualized curricula are developed."

Walker, Decker F. and Jon Schaffarzick. "Comparing Curricula," Review of Educational Research, 44: 83-111, Winter 1974.

This paper reviews experiments done since 1957 which compare the subject matter achievement of students using innovative curricula with that of students using traditional curricula in areas of Science, English, Social Studies, as well as Mathematics. Five studies involving 29 separate comparisons of S.M.S.G. with traditional courses are listed: 13 favor S.M.S.G., 6 favor the tradtional group and 10 favor neither. The authors summarized that "each curriculum did better on the distinctive parts of its own program, and each did about equally well on the parts they held in common."(108) The authors did not find "superiority" of new curricula over the traditional programs; they found "parity".

Walton, Gene A., Kathryn Ellen Havens, Helen Dolores Johnson, and Donald A. Paige. "A Follow-up Study of Two Methods of Teaching Mathematics: Traditional Versus New Math," School Science and Mathematics, 77: 251-255, March 1977.

The original study (1967) sampled 180 seventh grade students (90 control: traditional math, 90 experimental: modern math). The students were matched on the basis of their math grades and the Iowa Arithmetic Test Scores. The follow up study sampled 55 of the original 90 control and 58 of the original experimental group "to determine if any significant difference existed on senior high school mathematics grades and standardized test scores (PSAT) as a result of participating in the different... approaches to mathematics in junior high school." (253)

The results were as follows: high achieving students benefitted from the modern mathematics; average students profited from modern math "but to a lesser degree than expected" ; low achieving students also benefitted from the program but not significantly enough to assess the new curriculum as the best program to meet their needs.

Watman, Michael X. "Five Questions and Answers about Advanced General Mathematics," Mathematics Teacher, 65: 127-129, February 1972.

Watman's approach to teaching general mathematics includes individualized remedial work in basic skills, activities which apply mathematics to real situations, and introduction to modern topics "for variety."

The author also provides a list of articles and books which can be applied to teaching general mathematics.

Webb, Leland F. and David H. Ost. "Real Comprehensive Problem Solving As It Relates to Mathematics Teaching In the Secondary Schools," School Science and Mathematics, 78: 197-206, March 1978.

This is a superb article on the past, present and future of problem solving in mathematics curricula. The authors feel that the curricula currently used in schools "does not provide opportunity for real comprehensive problem solving." Programs such as U.I.C.S.M. and S.M.S.G. emphasized solving a problem "logically and precisely" in the context of mathematics but in an abstract sence not relating to real life situations in which an interdisciplinary education is needed. The authors feel most problems faced by individuals are "multidisciplinary...in nature, any problem less than this is probably unreal." Therefore it is the authors'opinion that the entire mathematics curricula should be revamped.

Webb, N.G.G. "Developing a Good Relationship Between Mathematics and Science," School Science Review, 54: 441-449, March 1973.
According to the ERIC Journal abstract EJ079136, this article "describes a list of topics in secondary school mathematics which have a direct relationship to science instruction."

Wegner, P. "A View of Computer Science Education," American Mathematical Monthly, 79: 168-179, February 1972.
The author proposes "an information structure approach to computer science education." He provides an eight course cor curriculum based on this approach. (This curriculum is for higher levels of mathematics.)

"Where Do You Stand? Computational Skill is Passe," Mathematics Teacher, 67: 485-488, October 1974.
The Mathematics Teacher Editorial Panel posed seven issues on the consequences of calculators and alternative instructional policies to a sample of teachers, mathematicians, and laymen. Sample responses are given in percentage form along with some individual positions.

White, Edwin P. "Problem Solving: Its History as a Focus In Curriculum Development," School Science and Mathematics, 78: 183-188, March 1978.
This article traces the "historical development of problem solving as a curriculum goal" in mathematics and science.

Wilder, R. L. "Mathematics and Its Relations to Other Disciplines," Mathematics Teacher, 66: 679-685, December 1973.
The author gives numerous examples of the "nature" of mathematics in its application to other fields of study. Based upon historical as well as present instances of the use of mathematics, Wilder suggests some excellent ideas for the "interdisciplinary" approach to the study of mathematics.

Wolfe, Martin S. "Mathematics - Programs and Trends," National Association of Secondary School Principals Bulletin, 60: 91-96, January 1976.
Wolfe compares the "old and new" math programs offered on the secondary school level. In doing so he concludes that the recent programs are superior and offer more options for students in mathematics. Mentioned is the Secondary School Mathematics Curriculum Improvement Study (SSMCIS) as the "prototype" for future secondary mathematics programs.

APPENDIX I

The following is a list of important sources which will be annotated at a later date:

Alspaugh, John W., R.D. Kerr, and Robert E. Reys, "Curriculum Change in Secondary School Mathematics," School Science and Mathematics, 70: 170-176, February 1970.

Austin, Joe Dan and William Asher. "An Alternative Interpretation of an Evaluation of a Modern Math Program," School Science and Mathematics, 72: 443-445, May 1972.

Bell, Max, Edward Esty, Joseph N. Payne, and Marilyn N. Suydam. "Hand-Held Calculators: Past, Present, and Future," 1977 Yearbook of the National Council of Teachers of Mathematics, Organizing for Mathematics Instruction, Washington D.C.: N.C.T.M., 1977.

Braunfield, Peter. "The Role of Algebra in a Modern K-12 Curriculum (Including a Description of the CSMP Algebra Program)," International Journal of Mathematics Education in Science and Technology, 4: 175-185, April-June 1973.

Geometry in the Mathematics Curriculum, 36th Yearbook of the National Council of Teachers of Mathematics, Washington, D.C.: N.C.T.M., 1973.

Higgons, Jon L. (editor). A Metric Handbook for Teachers, Reston Virginia: N.C.T.M., 1974.

Hill, Thomas J. Mathematical Challenges Plus Six, Reston, Virginia: N.C.T.M., 1974.

Kilpatrick, J. "Some Implications of the International Study of Achievement in Mathematics for Mathematics Educators," Journal for Research in Mathematics Education, 2: 164-171, March 1971.

Kinsella, John. "Problem Solving in the Teaching of Secondary School Mathematics," The Teaching of Secondary School Mathematics, Thirty-Third Yearbook of the National Council of Teachers of Mathematics, Washington D.C.: N.C.T.M., 1970

Murphy, M.O. and M.A. Polzin, "A Descriptive Analysis of the Teaching of the Metric System in the Secondary Schools," Science Education, 53: 89-94, February 1969.

National Advisory Committee on Mathematical Education. Overview and Analysis of School Mathematics, Grades K-12, Washington D.C.: Conference Board of Mathematical Sciences, 1975.

Scandura, Joseph M. "A Plan for the Development of a Conceptually Based Mathematics Curriculum for Disadvantaged Children II: Applications," Instructional Science,1 : 363-387, October 1972.

Sowder, Larry. "Teaching Problem-solving: Our Lip -service Objective?" School Science and Mathematics, 72: 133-116, February 1972.

Springer, George (Conference Director). Report of the Conference on the K-12 Mathematics Curriculum, Snowmass, Colorado, Washington D.C.: Educational Resources Information Center, June, 1973.

Trent, John H., Fenton Ray, and Donald Zimmerman. "Effectiveness of University of Illinois Committee on School Mathematics (UICSM) Stretchers and Shrinkers and Motion Geometry Materials in Improving Arithmetic Ability," School Science and Mathematics, 72: 822-827, December 1972.

Usiskin, Zalman P. "The Effects of Teaching Euclidean Geometry via Transformations on Student Achievement and Attitudes in Tenth-Grade Geometry," Journal for Research in Mathematics Education, 3: 249-259, November 1972.

Wells, D.W. and A.P. Shulte. "An Example of Planning for Low Achievers, The Teaching of Secondary School Mathematics, Thirty-Third Yearbook of the National Council of Teachers of Mathematics, Washington D.C.: N.C.T.M.,397-424, 1970.